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# मानक

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IS 4726 (1984): Light Weight Nylon Fabric for Parachutes  
[TXD 13: Textile Materials for Aerospace Purposes]



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“Knowledge is such a treasure which cannot be stolen”



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**IS : 4726 - 1984**  
**( Reaffirmed 1996 )**

*Indian Standard*  
SPECIFICATION FOR  
LIGHT WEIGHT NYLON FABRIC FOR  
PARACHUTES  
*( First Revision )*

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**BUREAU OF INDIAN STANDARDS**  
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG  
NEW DELHI 110002

AMENDMENT NO. 1    JANUARY 1986  
TO  
IS:4726-1984    SPECIFICATION FOR LIGHT WEIGHT NYLON  
FABRIC FOR PARACHUTES

*(First Revision)*

*(Page 6, clause 3.2, lines 2 and 5) - Substitute  
'460 cm<sup>3</sup>/s/cm<sup>2</sup>' for '450 cm<sup>3</sup>/s/cm<sup>2</sup>'.*

(TDC 27)

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AMENDMENT NO. 2      MAY 1987

TO

IS:4726-1984   SPECIFICATION FOR LIGHT WEIGHT  
NYLON FABRIC FOR PARACHUTES

(First Revision)

(Page 13, clause A-5.4) - Substitute the  
following for the existing clause:

'A-5.4 Repeat the test at intervals of 5 metres  
over the entire length of the piece.'

(TDC 27)

**AMENDMENT NO. 3 NOVEMBER 1998  
TO  
IS 4726 : 1984 SPECIFICATION FOR LIGHT WEIGHT  
NYLON FABRIC FOR PARACHUTES**

*( First Revision )*

*( Page 4, clause 2.2.1 )* — Substitute the following for the existing:

**‘2.2.1 Weave** — The weave shall be rip-stop plain as shown in Fig. 1 or Fig. 2. The reinforcement ribs in both the warp and the weft shall form a uniform pattern of squares. There shall be minimum of 26 repeats of pattern per decimetre both in the warp and weft directions. For better tearing strength requirements, the weave design as given in Fig. 2 shall be preferred.’

*( Page 4, Fig. 1, caption )* — Substitute the following for the existing :

**‘FIG. 1 RIP-STOP PLAIN’**

*( Page 5, Fig. 2, caption )* — Substitute the following for the existing :

**‘FIG. 2 RIP-STOP PLAIN’**

*[ Page 12, clause 8.1(b) ]* — Substitute the following for the existing :

**‘From the observed values for breaking load and tearing strength, the average  $\bar{X}$  shall be within the limit specified. No individual reading shall be less than 95 percent of the minimum value specified.’**

( TX 13 )

*Indian Standard*  
**SPECIFICATION FOR  
LIGHT WEIGHT NYLON FABRIC FOR  
PARACHUTES  
( First Revision )**

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**18 : 4726 - 1984**

*( Continued from page 1 )*

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*Indian Standard*  
SPECIFICATION FOR  
LIGHT WEIGHT NYLON FABRIC FOR  
PARACHUTES  
( *First Revision* )

## 0. FOREWORD

**0.1** This Indian Standard ( First Revision ) was adopted by the Indian Standards Institution on 15 November 1984, after the draft finalized by the Textile Materials for Aerospace Purposes Sectional Committee had been approved by the Textile Division Council.

**0.2** This Indian Standard based on IND/ADE/0064(a) ' NIV fabric, nylon light weight, undyed/OG for personnel parachutes ', was first published in 1968. The present revision has been taken up on the recommendation of Aerial Delivery Research and Development Establishment, Ministry of Defence, Agra, so that it can be implemented by them in toto.

**0.3** For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test, shall be rounded off in accordance with IS : 2-1960\*. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

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## 1. SCOPE

**1.1** This standard covers the requirements of light weight nylon fabric, 37 g/m<sup>2</sup>, for parachutes. The fabric is used in the fabrication of parachutes intended for personnel and other aerial delivery purposes.

## 2. MANUFACTURE

**2.1 Yarn** — The yarn used in the manufacture of the fabric shall be of high tenacity, multi-filament, bright, nylon type 66 or 6. The melting

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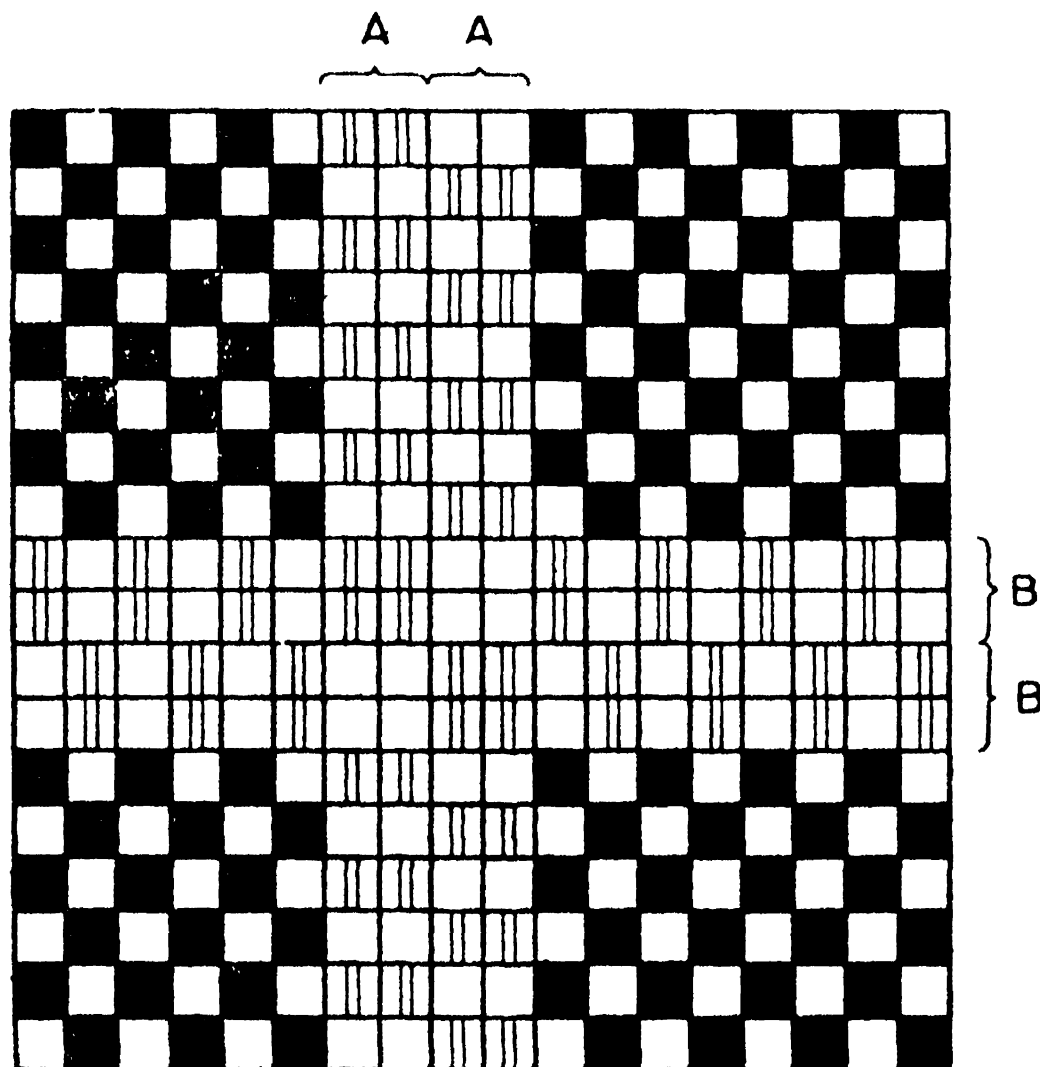
\*Rules for rounding off numerical values ( revised ).

point of yarn used in the manufacture of the fabric shall not be less than 244°C in case of nylon 66 and 210°C in case of nylon 6.

NOTE — The tenacity of the yarn may be as stated in the contract or the order if so desired by the purchaser.

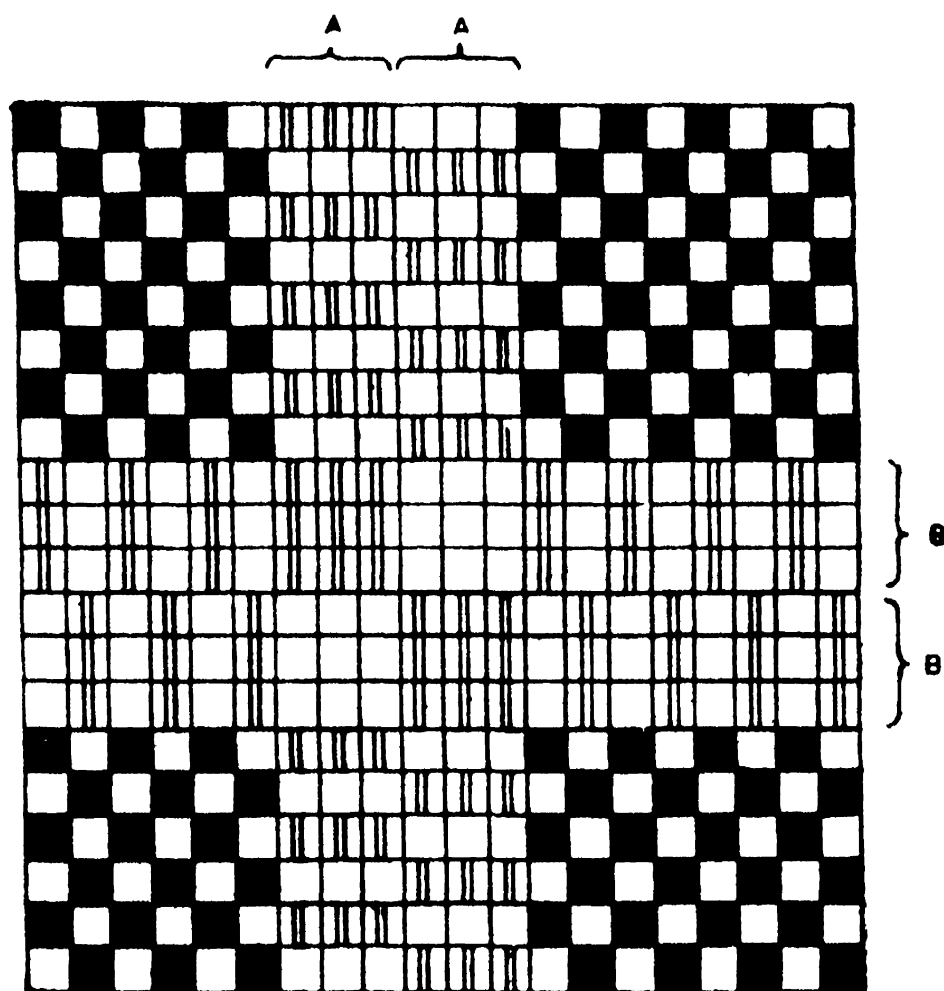
## 2.2 Fabric

**2.2.1 Weave** — The weave shall be rip-stop as shown in Fig. 1 or Fig. 2. The reinforcement ribs in both the warp and the weft shall form a uniform pattern of squares. There shall be a minimum of 26 repeats of pattern per decimetre both in the warp and weft directions.



A = TWO WARP ENDS WORKING AS ONE  
B = TWO PICKS PER SHED

FIG. 1 RIP-STOP WEAWE, 2/2



A = Three Warp Ends Working as One

B = Three Picks per Shed

FIG. 2 RIP-STOP WEAVE, 3/3

**2.2.2 Finish** — The fabric shall be given a preliminary scour, sufficient to remove sizing and other adhering material at a temperature which will not result in permanent setting of the fabric. The fabric shall then be heat-set under appropriate conditions of temperature and time followed by dyeing, as and when required, to the agreed shade with acid or disperse or pre-metalised dyes. The sequence of processes is at the manufacturers' discretion and shall be so accomplished as to achieve the specified properties. The fabric shall not be bleached.

**2.2.3** The selvages should be straight, even and well-made and should have the same tension as the remainder of the fabric. The fabric should be free from manufacturing and finishing defects [ see also 8.1(d) and Appendix E ]. The finished fabric shall be thoroughly clean and shall not have any objectionable odour.

**2.2.4** The fabric may be calendered at the discretion of the manufacturer provided the finished fabric complies with the requirements laid down in 3.1 to 3.7.

**2.2.5** The finished fabric should contain silicone polymer finish so applied that it is evenly and uniformly distributed throughout the fabric. The amount of silicone polymer applied shall be from 0.3 to 0.5 percent based on the dry mass of the fabric. The fabric after padding with silicone emulsion shall be dried and cured to obtain proper silicone polymer finish. The manufacturer shall submit a certificate for each roll indicating that the required quantity of silicone polymer finish has been applied.

**2.2.6** The residual size, finishing, or other non-fibrous material shall not exceed 2 percent of the dry mass of the fabric when evaluated by a method as agreed to between the buyer and the seller.

**2.3** The fabric shall be delivered within one year of its date of manufacture.

### **3. REQUIREMENTS**

**3.1 Construction and Physical Properties** — The fabric shall comply with the requirements of Table 1.

**3.2 Air Porosity** — The air porosity of the fabric shall be 320 to 450  $\text{cm}^3/\text{s}/\text{cm}^2$  for any individual reading. However, in a piece length of 40 m, one individual porosity reading may vary between 290 to 490  $\text{cm}^3/\text{s}/\text{cm}^2$ ; the mean air porosity of the piece, however, remaining between 320 and 450  $\text{cm}^3/\text{s}/\text{cm}^2$ .

**3.2.1** The air porosity of the fabric shall be determined by the method prescribed in Appendix A

**3.3 Permanence of Finish** — The permanence of finish of the fabric shall be such that when the fabric is subjected to the test specified in Appendix B, the conditions stipulated in 3.3.1 to 3.3.3 are fulfilled.

TABLE 1 PARTICULARS OF LIGHT-WEIGHT NYLON FABRIC FOR PARACHUTES, 37 g/cm<sup>2</sup>

(Clauses 0.2, 2.1 and 3.1)

UNIVERSAL COUNT IN TEX (OR DENIER) OF YARN ( APPROXI- MATE AND FOR INFORMATION ONLY )	ENDS/ dm	PICKS/ dm	TURNS PER METRE ( see NOTE 1 )	MASS	THICK- NESS ( see NOTE 2 )	BREAKING LOAD ON		ELONGA- TION AT BREAK, PERCENT Min	TEARING STRENGTH Min	WIDTH LENGTH					
						5.0 x 20 cm STRIPS. Min				kgf (N)	cm	m			
						Warp	Weft						kgf (N)	cm	m
3.3 ( or 30d ) ( or 30d )	520 ± 5 per- cent	520 ± 5 per- cent	200 to 250	37 ± 10 per- cent	mm 0.08	38 ( 372.4 )	38 ( 372.4 )	20 ( 22.5 )	2.3 ( 22.5 )	94 or as agreed	40 or as agreed				
METHOD OF TEST	—	IS : 1963-1981*	—	IS : 1964- 1970†	IS : 7702- 1975‡	IS : 1969-1968§	—	Appendix D	IS : 1954-1969						

NOTE 1 — Turns per metre values given in this table are for guidance only.

NOTE 2 — The thickness of the fabric shall be determined at a pressure of 210 g/cm<sup>2</sup>.

\*Method for determination of threads per unit length in woven fabric (second revision).

†Methods for determination of weight per square metre and weight per linear metre of fabric (first revision).

‡Methods for determination of thickness of woven and knitted fabrics.

§Methods for determination of breaking load and elongation at break of woven textile fabrics (first revision).

||Methods for determination of length and width of fabrics (first revision).

**3.3.1** The mean of the air porosity values determined after testing shall be within 15 percent of the mean of the readings determined before testing.

**3.3.2** The fabric thickness after testing shall not exceed by more than 10 percent of the thickness of the fabric before testing.

**3.3.3** The fabric shrinkage measured after testing shall not be more than 2 percent either in the warp or in the weft direction.

**3.4 Stability of Finish** — The stability of finish of the fabric shall be such that when the cloth is tested as specified in Appendix C, the change in air porosity shall not be greater than 7.5 percent of the value specified in 3.2.

**3.5 Melting Point** — The melting point of nylon yarn used in the manufacture of the fabric shall not be less than 244°C in case of nylon 66 and 210°C in case of nylon 6.

**3.5.1** The melting point of the nylon yarn shall be determined according to Appendix B of IS : 1843-1963\*.

**3.6 pH Value** — The pH value of the finished fabric shall not be less than 5.5 nor more than 8.5.

**3.6.1** The pH value of the finished fabric shall be determined by the cold method prescribed in IS : 1390-1984†.

**3.7 Colour Fastness** — The dyed fabric shall be fast to light and water. The minimum colour fastness rating of change in colour of the fabric to artificial light and to washing Test 1 shall be:

5 when tested by the method given in IS : 2454-1967‡; and

4 when tested by the method given in IS : 687-1979§.

**3.8 Sealed Sample** — If, in order to illustrate or specify the unmeasurable characteristics like general appearance, feel, etc, of the fabric, sample has been agreed upon and sealed, the supply shall be in conformity with the sample in such respects.

**3.8.1** The custody of the sealed sample shall be a matter of prior agreement between the buyer and the seller.

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\*Specification for nylon-monofilaments.

†Methods for determination of pH value of aqueous extracts of textiles (first revision).

‡Method for determination of colour fastness of textile materials to artificial light (xenon lamp).

§Method for determination of colour fastness of textile materials to washing: Test 1 (second revision).

## 4. PACKAGING

**4.1** The nylon fabric shall be packed in continuous length on cardboard rolls which have been previously covered by a layer of kraft paper ( *see* IS : 1397-1967\* ).

## 5. MARKING

**5.1** Each roll of nylon fabric shall be marked on both ends with the following information:

- a) Name of the material;
- b) Manufacturers' name, initials or trade-mark;
- c) Identification No. of the fabric;
- d) Width and length of the fabric;
- e) Date, month and year of manufacture;
- f) Mean air porosity; and
- g) Colour fastness ratings in the case of dyed fabric.

**5.1.1** The fabric may also be marked with the Standard Mark .

NOTE — The use of the Standard Mark is governed by the provisions of the Bureau of Indian Standards Act, 1986 and the Rules and Regulations made thereunder. The Standard Mark on products covered by an Indian Standard conveys the assurance that they have been produced to comply with the requirements of that standard under a well defined system of inspection, testing and quality control which is devised and supervised by BIS and operated by the producer. Standard marked products are also continuously checked by BIS for conformity to that standard as a further safeguard. Details of conditions under which a licence for the use of the Standard Mark may be granted to manufacturers or producers may be obtained from the Bureau of Indian Standards.

## 6. PACKING

**6.1** The rolls shall be wrapped with polyethylene film ( *see* IS : 2508-1977† ). A suitable number of such rolls shall be arranged in bundles and secured by 3-ply jute twine or cotton twine to form a pack. A suitable number of such packs shall then be wrapped with kraft paper and placed in wooden packing case, which is previously lined with one layer of waterproof packing paper. The gross mass of the case shall not exceed 40 kg. The empty spaces, if any, in the case shall be stuffed with cushioning material to avoid damage to the contents in transit. The case shall be nailed taking care to see that the rolls do not pierce the fabric inside the case.

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\*Specification for kraft paper ( *first revision* ).

†Specification for low density polyethylene film ( *first revision* ).



## **7. SAMPLING**

**7.0** The samples shall be drawn lot-wise for carrying out tests specified in this standard. Unless otherwise specified, the lot shall be as defined under respective sampling plans as detailed in 7.1 to 7.3.

### **7.1 Sampling Plan 'A' for Air Porosity**

**7.1.1 Lot** — The total length of the nylon fabric manufactured from the same type of yarn and of same weave and finish delivered to a buyer against one despatch note shall constitute a lot.

**7.1.2** Each roll of the lot shall be tested for air porosity ( non-destructive ) at intervals of 5 m.

### **7.2 Sampling Plan 'B'**

**7.2.1 Lot** — All the rolls of nylon fabric manufactured from same type of yarn and of same weave and finish delivered to a buyer against one despatch note shall constitute a lot.

**7.2.2** One sample of one metre in length and of full width shall be drawn from each roll for carrying out the following tests:

- a) Mass,
- b) Thickness,
- c) Breaking load,
- d) Elongation at break,
- e) Tearing strength, and
- f) Yarns per decimetre.

### **7.3 Sampling Plan 'C'**

**7.3.1 Lot** — The quantity of nylon fabric manufactured from the same type of yarn and of same weave and finish delivered to a buyer against one despatch note shall constitute a lot.

**7.3.2** One sample of two metres in length and of full width shall be selected from each lot for carrying out the following tests:

- a) Permanance of finish,
- b) pH value of aqueous extract,
- c) Colour fastness to light and washing,
- d) Stability of finish,
- e) Weave,
- f) Melting point of yarn,
- g) Tenacity of yarn, and
- h) Turns per metre.

## 8. VISUAL INSPECTION AND CRITERIA FOR CONFORMITY

**8.1** Each lot as defined in 7.3.1 shall be visually examined for the following:

- a) *Width* — The width of the roll of fabric shall not be less than 94 cm or as agreed. The rolls having less width shall be segregated and rejected.
- b) *Total Length of Each Roll* — The lot shall be unacceptable if the total of the actual length of the rolls examined is less than the total of the length marked on the rolls.
- c) Each roll shall be examined for the markings as detailed in 5.1, on both ends.
- d) *Freedom from Defects* — Each roll shall be visually examined for the defects as specified in Appendix E. No roll shall contain more than 7 major defects/100 m. For this purpose, all the rolls shall be visually examined metre by metre and the defects classified in accordance with Appendix E. The unit of the product for examination shall be one linear metre. For each unit of product, the defects shall be counted as follows:
  - (i) One major defect and one minor defect shall be counted as one major defect.
  - (ii) Three or more minor defects shall be counted as one major defect.
  - (iii) One or more major defects shall be counted as one major defect.
  - (iv) A continuous major defect shall be counted as one major defect for each unit of product or fraction thereof in which it occurs.
- e) Each major defect shall be flagged by a red string sewn in the selvedge. Three minor defects occurring per linear metre shall be flagged by a red string sewn in the selvedge. 50 cm allowance shall be made for each major defect flagged except for continuous defect which shall be given a one metre allowance for each metre in which defect occurs.
- f) Unless otherwise specified the fabric shall be in continuous lengths of not less than 80 m without joints. Shorter cuts are

allowed in accordance with the following:

<i>Minimum Length of Cuts</i>	<i>Permissible Short Cuts in Total Supply</i>
m	percent
80	75
40	15
10	10

- g) *Overall Examination* — Each roll shall be visually examined for overall defects as follows:
- (i) Spotiness, poor penetration of dye or off shade,
  - (ii) Uneven weaving throughout; and
  - (iii) Unevenness and streakiness of dyeing in excess of that shown by sealed sample ( *see 3.8* ) for appearance.
- h) From the observed values for breaking load and tearing<sup>1</sup> strength, the average  $\bar{x}$  shall be within the limit specified. No individual reading shall be less than 5 percent of the minimum value specified.
- j) All the test specimens tested for the remaining characteristics shall also satisfy the relevant requirements.

## **A P P E N D I X    A**

( *Clause 3.2.1* )

### **METHOD FOR DETERMINATION OF AIR POROSITY**

#### **A-1. TEST SPECIMENS**

**A-1.1** For the purpose of this test, all the pieces of nylon fabric selected as in 7.1.2 constitute the **test specimens**.

#### **A-2. CONDITIONING OF TEST SPECIMENS**

**A-2.1** Prior to test, the test specimens shall be conditioned in a standard atmosphere at  $65 \pm 2$  percent relative humidity and  $27 \pm 2^\circ\text{C}$  temperature for 24 hours ( *see also IS : 6359-1971\** ).

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\*Methods for conditioning of textiles

### A-3. PRINCIPLE

**A-3.1** The method is based on the measurement of the rate of flow of air through a given area of the fabric by a given pressure drop across the fabric.

### A-4. APPARATUS

**A-4.1** The apparatus shall consist of:

- a) a suction or a blower fan for drawing air through a known area of fabric;
- b) circular orifice;
- c) clamp to hold the test specimen ( see Note );
- d) means for adjusting the pressure drop across the fabric to a known amount, and
- e) means for measuring the velocity of air flowing through the fabric.

NOTE — The clamp should be such as to effectively eliminate peripheral leakage of air.

**A-4.2** The apparatus shall be capable of testing large pieces without cutting.

### A-5. PROCEDURE

**A-5.1** Take one of the test specimens conditioned as in A-2 above. Mount a portion of the test specimen between the clamp and the circular orifice with sufficient tension to eliminate wrinkles, if any, taking care to see that the fabric is not distorted in its own plane.

**A-5.2** Start the suction or the blower fan and adjust the rate of flow of air till a pressure drop of 25 cm waterhead across the fabric is indicated.

**A-5.3** Note the rate of flow of air in cubic centimetre per second.

**A-5.4** Repeat the test at intervals of 4 m over the entire length of the piece.

**A-5.5** Calculate the mean of all the test values.

**A-5.6** Calculate the rate of flow of air per square centimetre of fabric per second by the following formula:

$$F = \frac{f}{A}$$

where

$F$  = rate of flow of air per square centimetre of fabric in cubic centimetre per second,

$f$  = mean rate of flow of air in cubic centimetre per second through the fabric as obtained in A-5.5, and

$A$  = area of the fabric under test in square centimetres.

**A-5.7** Repeat the test with the remaining test specimens.

## **A P P E N D I X   B**

( *Clause 3.3* )

### **METHOD FOR DETERMINATION OF PERMANANCE OF FINISH**

#### **B-1. TEST SPECIMENS**

**B-1.1** Cut out two test specimens measuring approximately 50 × 50 cm from each piece of nylon fabric.

#### **B-2. PROCEDURE**

**B-2.1** Determine the air porosity and thickness of the two test specimens taken from the same piece in accordance with the method prescribed in Appendix A and Table 1.

**B-2.2** Using a template and indelible ink, mark out a square measuring 45 × 45 cm on each test specimen. Make the test specimen in the form of loops by stapling the two opposite sides in such a way that one of the test specimens has the warp yarns and the other has the weft yarn in the vertical direction in the loop. Place both the test specimens in the loop form in a container of adequate capacity filled with boiling water to within 7.5 cm of the top. Insert a glass rod of 6.5 mm diameter and 55 cm long on the top of the loop of each test specimen. Place a glass tube or rod of similar dimensions as the glass rod and weighing approximately 45 g at the bottom of the loop of each test specimen. Suspend both the loops in such a way ( by binding each glass rod with twine or wire to another glass rod of similar dimensions to rest on the top of the container ) that they are completely immersed in the boiling water.

**B-2.3** Subject the specimens to the action of boiling water for a period of 15 minutes. Remove the test specimens from the bath and allow the water to drain off for a few minutes. Remove the staples from the test specimens and place them flat on a horizontal screen and dry them in air.

**B-2.4** When the test specimens are thoroughly dried, condition the test specimens in a standard atmosphere of  $65 \pm 2$  percent RH and  $27^\circ \pm 2^\circ\text{C}$  for at least 4 hours.

**B-2.5** Measure the 45 cm square marked on the specimens to the nearest millimetre at 6 different places, 3 in the warp direction and 3 in the weft direction and compute the mean of each.

**B-2.6** Measure the air porosity of the test specimens by the method given in Appendix A and compute the mean air porosity.

**B-2.7** Measure the thickness of the specimens in accordance with the method prescribed in Table 1 and compute the mean thickness.

**B-2.8** Calculate the percentage shrinkage in the warp and the weft direction of the test specimens by the following formula:

$$S = \frac{45 - d}{45} \times 100$$

where

$S$  = percentage shrinkage in the warp or the weft direction,  
and

$d$  = mean distance between the marks in cm after boiling  
( see **B-2.5** ).

**B-2.9** Repeat the test with the remaining test specimens.

## APPENDIX C

( Clause 3.4 )

### METHOD FOR DETERMINATION OF STABILITY OF FINISH

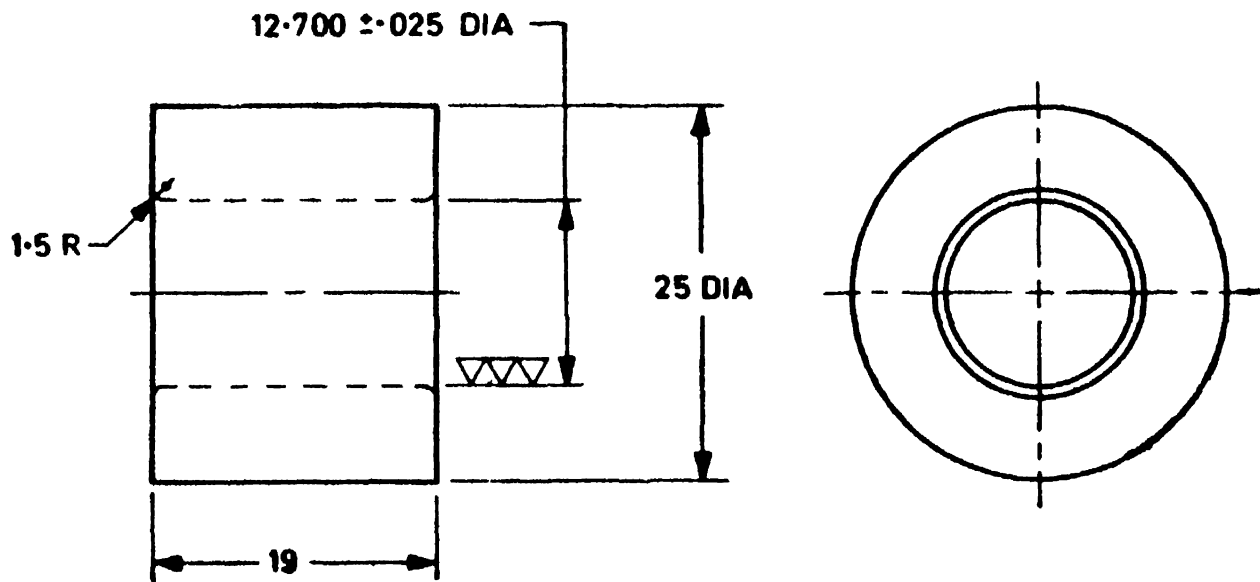
**C-1.** Cut out a test specimen measuring 90 × 90 cm from each piece of nylon fabric.

### C-2. APPARATUS

**C-2.1 Metal Bushing** — Having an orifice as described in Fig. 3.

### C-3. PROCEDURE

**C-3.1** Mark 5 circles on the test specimen. The circles shall have a diameter equal to but not exceeding 5 cm more than the diameter of the orifice of the bushing. Position 4 circles one each at the corner on the diagonal lines connecting opposite corners and at one-third of the distance from the corner. Position the fifth circle in the centre of the specimen.



All dimensions in millimetres.

FIG. 3 BUSHING

**C-3.2** Determine the air porosity of the test specimen in accordance with the method given in Appendix A.

**C-3.3** Insert one corner of the specimen through the orifice in the bushing and pull the specimen through the bushing back and forth for 2.5 cycles, that is, a total of 5 passes through the bushing is made.

**C-3.4** Insert the adjacent corner to the first corner tested as in **C-3.3** through the bushing and repeat the procedure until the specimen has been pulled through the bushing for 5 complete cycles, that is, a total of 10 passes through the bushing is made. The specimen shall be pulled straight through the bushing by pulling the specimen in the vertical direction. Care shall be taken to ensure that yarns that might ravel out of the specimen do not get entangled with the bushing and restrain the specimen when being pulled through the bushing.

**C-3.5** Determine the air porosity of the specimen at the 5 circles marked on it as prescribed in Appendix A.

**C-3.6** Compare the air porosity value taken before testing and after testing.

**C-3.7** Repeat the test with the remaining test specimens.

#### C-4. REPORT

**C-4.1** Report the lot as conforming to the requirements of 3.4 if the value obtained after testing is not more than 7.5 percent of the value obtained before testing.

## APPENDIX D

( Clause 3.1 and Table 1 )

### METHOD FOR DETERMINATION OF TEARING STRENGTH OF WOVEN FABRICS

#### D-1. TEST SPECIMEN

**D-1.1** Prepare ten rectangular test specimens of size  $75 \times 200$  mm, five from each warp and weft direction. Cut the specimens to be used for the measurement of the tearing strength of warp yarns with the longer dimensions parallel to the weft yarns and the specimens to be used to measure the tearing strength of weft yarns with the longer dimensions parallel to the warp yarns. Cut a 75 mm slit lengthwise in each specimen starting in the centre of one of the short edges. Test the specimens in each warp and weft direction.

#### D-2. CONDITIONING OF THE TEST SPECIMENS

**D-2.1** Prior to test, the test specimen shall be conditioned in a standard atmosphere at  $65 \pm 2$  percent RH and  $27 \pm 2^\circ\text{C}$  temperature ( *see* IS : 6359-1971\* ) for at least 24 hours.

#### D-3. APPARATUS

**D-3.1 Tensile Testing Machine of Constant Rate of Traverse Type** — The maximum load required to tear the specimens shall be within the rated operating capacity of the tester which may be considered as the range of 15 to 85 percent of the rated capacity.

**D-3.2** Clamps, having gripping surfaces parallel, flat and capable of preventing slipping of the specimen during a test, and measuring at least  $25 \times 75$  mm, with the longer dimensions perpendicular to the direction of application of the load.

#### D-4. PROCEDURE

**D-4.1** Test the conditioned specimens in the standard atmosphere of  $65 \pm 2$  percent relative humidity and  $27 \pm 2^\circ\text{C}$  temperature.

**D-4.2** Set the nominal gauge length at 75 mm and select the capacity of the tester suitable for the specimen to be tested. Operate the pulling jaw at  $300 \pm 10$  mm/min.

**D-4.3** Disengage the pawls on the pendulum from the ratchet so that they become inoperative.

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\*Method for conditioning of textiles.



**D-4.4** Place the specimen in the clamps so that the slit is centered in the jaws and one of the tongues is held in each clamp in such a manner that originally adjacent cut edges of the tongues form a straight line joining the centres of the clamps and the two tongues present opposite faces of the fabric to the operator.

**D-4.5** If the force to tear a single specimen is less than the minimum working range of the tester at the time of use, superimpose the minimum number of specimens required to bring the tearing force within working range of the tester to form a multiply specimen and in that case appropriate number of test specimens are to be prepared according to **D-1.1**. If a multiply specimen is required, grip the plies together in the machine and tear them simultaneously.

**D-4.6** Start the testing machine and the autographic recorder. Continue the tear until the moving jaw has travelled for a minimum of 75 mm after the tear was initiated as registered on the chart (approximately 38 mm length of tear).

## **D-5. CALCULATION**

**D-5.1** Calculate the tearing strength of each specimen by averaging the five highest peak load registered during 75 mm of travel of the moving clamp ignoring the initial peak load ( *see Note* ) and dividing by the number of plies if more than single ( *see D-4.5* ).

**NOTE** — Frequently the initial peak force required to continue the tear is substantially greater than subsequent peak and should be ignored in the calculation.

**D-5.2** Calculate the tearing strength of the sample as the average of the tearing strength obtained for the tested specimens ( *see D-5.1* ) to the nearest 50 g in both warp and weft direction. Divide the average obtained by the number of plies in the specimen.

## **D-6. REPORT**

**D-6.1** Report the lot to be in conformity with the requirements of **3.3**, if the average tearing strength of the test specimens in both warp and weft directions as calculated above are not less than the minimum specified in Table 1, col 2.

## APPENDIX E

[ *Clauses 2.2.3 and 8.1(e)* ]

### CLASSIFICATION OF DEFECTS

<i>Defect</i>	<i>Description</i>	<i>Major Minor</i>	
Abrasion	Any abrasion mark showing fuzziness	×	
Biased filling	Biased filling more than 5 cm from horizontal at greatest point of bias	×	
Bowed filling	Filling bow more than 5 cm in height ( as measured from a straight line cord to the highest point of arc )	×	
Broken or missing end	Two or more contiguous, regardless of length	×	
	Single, more than 90 cm long Single 90 cm long or less.	×	×
Broken or missing pick	Two or more contiguous, regardless of length	×	
	One pick, full width		×
Cut, hole, or tear ( other than pin holes, etc )	Three or more warp or filling threads ruptured at adjoining points	×	
Floats or skips	Any multiple float 5 mm or more	×	
	Single floats of 1 cm or more in length	×	
	Contiguous float or pin floats*, the sequence of which measures 2 cm or more in length.	×	
	Any multiple float up to 5 mm square	—	×
	Single float up to 1 cm in length	—	×
	Contiguous float or pin floats*, the sequence of which measures less than 2 cm in length	×	—

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\*A pin float is defined as a float measuring 3 mm or less. Single pin float shall not be considered as defect.

<i>Defect</i>	<i>Description</i>	<i>Major Minor</i>	
Heavy filling bar or heavy place	Over 0.5 cm in width and varying 10 percent or more from normal pick count	×	
	Over 1 cm in width and varying less than 10 percent from normal pick count	×	
	0.5 cm or less in width and varying 10 percent or more from normal pick count	—	×
	1 cm or less in width and varying less than 10 percent from normal pick count		×
Jerked-in filling	Any jerked-in filling occurring more than 4 times within 25 cm	×	
	Any jerked-in filling occurring 4 times or less within 25 cm	—	×
Loops, kinks or snarls ( except selvedge )	All over 3 mm in length	×	
	Three or more ( in any linear metre ) up to 3 mm in length	×	
	Up to two ( in any linear metre ) up to 3 mm in length		×
Mispick or double pick	Three or more additional picks in the shed	×	
	Two picks		×
Pin holes or yarn deformations	Over 6 pinholes or yarn deformations occurring within an area equal to a 15 cm diameter circle	×	
	Three to six pin holes or yarn deformations occurring within an area equal to a 15 cm diameter circle		×
Selvedge cut, broken, torn scalloped	Any cut, broken, torn, or scalloped selvedge	×	
Selvedge slack or wavy	Clearly noticeable waviness along selvedge edge when no tension is on selvedge	×	

<i>Defect</i>	<i>Description</i>	<i>Major</i>	<i>Minor</i>
Selvedge stringy or loopy 1.5 mm ( 1/16 in ) loops shall be acceptable	More than 8 cm of continuous stringy or loopy selvedge projecting 3 mm or more	×	
	Continuous stringy or loopy selvedge projecting up to 3 mm	—	×
Selvedge tight	Any clearly noticeable roll of edge or edges when tension is released	×	
Reinforced selvedge fraying	Design proper weave eliminate warp fraying	—	×
Smash	Any smash	×	
Spot, stain or streak ( not applicable to dye streaks )	Single ends or picks 40 cm or more in length	×	
	Double ends or picks 20 cm or more in length	×	
	Over 2 ends or picks 12 cm or more in length or a clearly noticeable area more than 6 mm <sup>2</sup> in area whichever is greater	×	
	Single ends or picks 6 cm up to 40 cm in length	—	×
	Over two ends or picks less than 12 cm in length or a clearly noticeable area 6 mm <sup>2</sup> or less in area, whichever is greater.		×
Slubs or strip back*	More than 5 over 1 cm in length	×	
	Two up to and including 5 over 2 cm in length	×	
	One over 2 cm in length	×	
	Five or less over 1 cm but not exceeding 1 cm in length	—	×

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\*A strip back is defined as a broken filament(s) wrapped around the remaining yarn forming an enlarged area resembling a slub.

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<i>Defect</i>	<i>Description</i>	<i>Major</i>	<i>Minor</i>
	One over 1 cm but not exceeding 2 cm in length	—	×
Weak place	Any weak place	×	
Weave	Pattern not conforming to weave diagram specified	×	
Width	Less than specified	×	
Wrong draw	Resulting in clearly noticeable warpwise streak more than 45 cm in length	×	
Manufacturer's Missing ( weavers ) Identification yarn		×	

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